

**WHAT IS CLAIMED IS:**

1. A light-emitting device, comprising:  
a multi-layer stack of materials including a light-generating region, and a first layer supported by the light-generating region, a surface of the first layer being configured so that light generated by the light-generating region can emerge from the light-emitting device via the surface of the first layer; and  
a material in contact with the surface of the first layer, the material having an index of refraction less than about 1.5,  
wherein the light emitting device is packaged.
2. The light-emitting device of claim 1, wherein the surface of the first layer has a dielectric function that varies spatially according to a pattern.
4. The light-emitting device of claim 1, wherein the surface of the first layer has features with a size of less than about  $\lambda/5$ , where  $\lambda$  is a wavelength of light that can be emitted by the first layer.
5. The light-emitting device of claim 1, wherein the light-emitting device is in the form of a packaged die.
6. The light-emitting device of claim 1, wherein the material comprises a gas.
7. The light-emitting device of claim 6, wherein the gas comprises air.
8. The light-emitting device of claim 6, wherein a pressure of the gas is less than about 100 Torr.
9. The light-emitting device of claim 1, wherein the material has an index of refraction of at least about one.

10. The light-emitting device of claim 1, wherein the packaged light-emitting device is free of an encapsulant material.

11. The light-emitting device of claim 1, further comprising a cover, the material having an index of refraction of less than about 1.5 being between the cover and the surface of the first layer.

12. The light-emitting device of claim 11, wherein the cover comprises a phosphor material.

13. The light-emitting device of claim 12, wherein the cover is configured so that light generated by the light-generating region that emerges via the surface of the first layer can interact with the phosphor material, and so that light that emerges via the surface of the first layer and interacts with the phosphor material emerges from the cover as substantially white light.

14. The light-emitting device of claim 1, further comprising:  
a first sheet comprising a material that is substantially transparent to light that emerges from the light-emitting device; and  
a second sheet comprising a phosphor material, the second sheet being adjacent the first sheet,  
wherein the material having an index of refraction of less than about 1.5 is between the first sheet and the surface of the first layer.

15. The light-emitting device of claim 14, the first and second sheets being configured so that light generated by the light-generating region that emerges via the surface of the first layer can interact with the phosphor material, and so that light that emerges via the surface of the first layer and interacts with the phosphor material emerges from the second sheet as substantially white light.

16. The light-emitting device of claim 1, further comprising a support that supports the multi-layer stack of materials.

17. The light-emitting device of claim 16, further comprising a layer of reflective material that is capable of reflecting at least about 50% of light generated by the light-generating region that impinges on the layer of reflective material, the layer of reflective material being between the support and the multi-layer stack of materials.

18. The light-emitting device of claim 17, wherein the reflective material is a heat sink material.

19. The light-emitting device of claim 18, wherein the heat sink material is configured so that the heat sink material has a vertical heat gradient during use of the light-emitting device.

20. The light-emitting device of claim 17, further comprising a heat sink material disposed adjacent the support.

21. The light-emitting device of claim 20, wherein the heat sink material is configured so that the heat sink material has a vertical heat gradient during use of the light-emitting device.

22. The light-emitting device of claim 1, further including a current-spreading layer between the first layer and the light-generating region.

23. The light-emitting device of claim 1, further comprising electrical contacts configured to inject current into the light-emitting device.

24. The light-emitting device of claim 23, wherein the electrical contacts are configured to vertically inject electrical current into the light-emitting device.

25. The light-emitting device of claim 1, wherein the light-emitting device is selected from the group consisting of light-emitting diodes, lasers, optical amplifiers, and combinations thereof.
26. The light-emitting device of claim 1, wherein the light-emitting device comprises a light emitting diode.
27. The light-emitting device of claim 1, wherein the light-emitting device is selected from the group consisting of OLEDs, flat surface-emitting LEDs, HBLEDs, and combinations thereof.
28. The light-emitting device of claim 1, wherein the surface of the first layer has a dielectric function that varies spatially according to a pattern with an ideal lattice constant and a detuning parameter with a value greater than zero.
29. The light-emitting device of claim 1, wherein the surface of the first layer has a dielectric function that varies spatially according to a pattern, and the pattern does not extend into the light-generating region.
30. The light-emitting device of claim 1, wherein the surface of the first layer has a dielectric function that varies spatially according to a pattern, and the pattern does not extend beyond the first layer.
31. The light-emitting device of claim 1, wherein the surface of the first layer has a dielectric function that varies spatially according to a pattern, and the pattern extends beyond the first layer.
32. The light-emitting device of claim 1, further comprising a layer of reflective material that is capable of reflecting at least about 50% of light generated by the light-generating region that impinges on the layer of reflective material,

wherein the light-generating region is between the layer of reflective material and the first layer.

33. The light-emitting device of claim 1, further comprising a layer of reflective material that is capable of reflecting at least about 50% of light generated by the light-generating region that impinges on the layer of reflective material,

wherein the light-generating region is between the layer of reflective material and the first layer.

34. The light-emitting device of claim 1, wherein the surface of the first layer has a dielectric function that varies spatially according to a nonperiodic pattern.

35. The light-emitting device of claim 1, wherein the surface of the first layer has a dielectric function that varies spatially according to a complex periodic pattern.